

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SONY CORP

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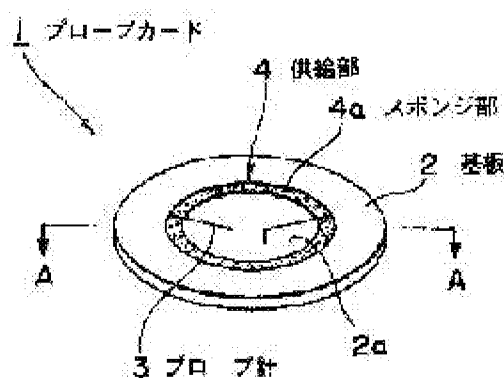
(72)Inventor : SAKAMOTO TSUTOMU

## (54) PROBE CARD AND METHOD FOR TESTING ELECTRIC CHARACTERISTIC OF BODY TO BE TESTED

(57)Abstract:

PROBLEM TO BE SOLVED: To make the electric characteristics of a body to be tested testable with high accuracy without causing any defective conditions such as the adhesion of the material of the electrode pad of a body to be tested to the tip of a probe needle, the oxidation of the tip side of the probe needle.

SOLUTION: The probe card 1 is provided with a substrate 2 and a probe needle 3 in a state supported by the substrate 2 extended downward from the probe card 1, and the tip of the probe needle 3 is brought into contact with an electrode pad of a body to be inspected to test the electric characteristics of the body to be tested. The probe card 1 is provided with a supply part 4 for supplying the probe needle 3 with a coating liquid so as to coat the surface of the tip side of the probe needle 3 at all times. The coating liquid is formed of a liquid which is non-conductive, is nonvolatile in test atmosphere, and does not corrode the body to be tested. At the time of test, by bringing the tip of the probe needle 3 into contact with the electrode pad of the body to be tested as coating the surface of the tip side of the probe needle 3 with the coating liquid, the electric characteristics of the body to be tested are tested.



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**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*).
2. Texts in the figures are not translated and shown as it is.

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## FULL CONTENTS

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### [Claim(s)]

[Claim 1] In the probe card for having a substrate and the probe needle prolonged in the lower part from the substrate after having been supported by this board, making the electrode pad in which the tip of this probe needle was established by the inspected object contact, and inspecting the electrical property of an inspected object It is the probe card which is equipped with the feed section which supplies covering liquid to a probe needle so that the tip side surface of said probe needle may always be covered, and is characterized by consisting of a liquid which is alike [ inspection atmosphere ], and nonvolatile and does not corrode an inspected object while said covering liquid is non-conducting.

[Claim 2] It is the probe card according to claim 1 which said feed section is equipped with the sponge part containing said covering liquid, and is characterized by said substrate coming to support said probe needle in the state where it was inserted in said sponge part.

[Claim 3] Said covering liquid is a probe card according to claim 1 characterized by consisting of material of the 3rd oil.

[Claim 4] The electrical-characteristics-inspection method of the inspected object characterized by contacting the tip to the electrode pad of an inspected object, and conducting electrical characteristics inspection of an inspected object, it being nonvolatile and the covering liquid which does not corrode an inspected object covering the tip side surface of a probe needle in inspection atmosphere while being non-conducting.

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] The semiconductor wafer with which the integrated circuit was formed in detail about the electrical property method of a probe card and an inspected object as for

this invention (It is hereafter described as a wafer) etc. -- from -- it is related with the electrical property method of the inspected object applied to the probe card with which the probe equipment which inspects the electrical property of the becoming inspected object is equipped, and its inspection.

[0002]

[Description of the Prior Art] Conventionally, by the manufacturing process of semiconductor devices, such as LSI, after a wafer process is completed and two or more IC chips etc. are formed in a wafer, inspecting the electrical property of each chip with wafer form voice is conducted using the probe equipment called a prober.

[0003] Probe equipment is equipped with a probe card with a substrate and two or more probe needles (measuring needle) which are supported by the substrate and contact a tip to the electrode pad of each chip of the wafer which is an inspected object, and is constituted. What was prepared in perpendicular needle type The state where the probe needle formed, for example with material, such as tungsten and beryllium, was prolonged right under a slanting lower part (horizontal needle type) or right under from the substrate as a probe card, for example is known.

[0004] [ in inspecting the electrical property of each chip using probe equipment equipped with such a probe card ] The tip of a probe needle is contacted to the electrode pad of each chip with wafer form voice, the inspecting circuit established in the main part of probe equipment through the probe card and each chip are connected, and predetermined current is sent through each chip from this inspecting circuit. The electrical property of each chip is inspected by this.

[0005]

[Problem to be solved by the invention] However, [ the conventional probe card ] while being in the state where the probe needle is always exposed to the atmosphere Since it will be in the state where current is always sent by the contact portion of a probe needle and the electrode pad of a chip at the time of inspection, the tip side of a probe needle and the above-mentioned contact portion oxidize easily, and the fault of the material (for example, aluminum) of the electrode pad of a chip adhering at the tip of a probe needle arises. Such fault becomes the factor which causes various abnormalities in electrical characteristics inspection, such as making contact resistance high and generating loose connection.

[0006] Therefore, cleaning of grinding the tip side of a probe needle must be performed frequently, and the thing with a complicated maintenance and a short life of a probe needle serves as the present condition. It is anxious for development of the technology in which electrical characteristics inspection of a chip can be conducted with sufficient accuracy, without the material of the electrode pad of a chip adhering at the tip of a probe needle, or producing the fault of the tip side of a probe needle oxidizing from the above thing.

[0007]

[Means for solving problem] [ then, the probe card applied to this invention in order to solve the above-mentioned technical problem ] In the thing for having a substrate and the probe needle prolonged in the lower part from the probe card after having been supported by this substrate, contacting the tip of a probe needle to the electrode pad of an inspected object, and inspecting the electrical property of an inspected object It has the feed section which supplies covering liquid to a probe needle so that the tip side surface of a probe needle may always be covered, and while the covering liquid is non-conducting, in inspection atmosphere, it is nonvolatile and has composition which consists of a liquid which does not corrode an inspected object.

[0008] Moreover, the electrical-characteristics-inspection method of the inspected object concerning this invention is the same covering liquid as the above-mentioned invention, covering the tip side surface of a probe needle, contacts the tip to the electrode pad of an inspected object, and conducts electrical characteristics inspection of an inspected object.

[0009] Since it has the feed section which supplies the covering liquid which is nonvolatile and does not corrode an inspected object in inspection atmosphere to a probe needle while being non-conducting so that the tip side surface of a probe needle may always be covered with the probe card of this invention, The tip side of a probe needle is always in the state where it is not exposed to the atmosphere. Therefore, the oxidization by the side of the tip of a probe needle does not occur the time of inspection, and before and behind that. Moreover, since the tip side of a probe needle is covered with covering liquid, at the time of inspection, the circumference of the contact portion of the tip of a probe needle and the electrode pad of an inspected object will also be covered with covering liquid. Therefore, the thing which oxidization does not occur in this contact portion, and constitute an electrode pad and which material, such as aluminum, adheres at the tip of a probe needle, for example is prevented.

[0010] moreover, [ the electrical-characteristics-inspection method of the inspected object of this invention ] In order to contact the tip to the electrode pad of an inspected object and to conduct electrical characteristics inspection of an inspected object with them, covering the tip side surface of a probe needle with the covering liquid in the probe card of the above-mentioned invention, and the same covering liquid, Inspection is carried out where the circumference of the contact portion of the tip of a probe needle and the electrode pad of an inspected object is also covered with covering liquid. Therefore, electrical characteristics inspection of an inspected object can be conducted, stopping that the component of an electrode pad adheres at the tip of a probe needle, without oxidizing the contact portion of the tip of a probe needle, and an electrode pad with the tip side of a probe needle.

[0011]

[Mode for carrying out the invention] The embodiment of the electrical-characteristics-inspection method of the probe card concerning this invention and an inspected object is

hereafter explained based on Drawings. Drawing 1 is the perspective view showing one embodiment of the probe card concerning this invention, and drawing 2 is an A-A arrowed cross-section in drawing 1 . Moreover, drawing 3 is the enlarged drawing of B portion in drawing 2 .

[0012] The probe equipment used at electrical-characteristics-inspection processes, such as IC chip currently formed in the wafer which is an inspected object, is equipped with this probe card 1, and there is from the thing of a horizontal needle type. As shown in drawing 1 - drawing 3 , it has the disc-like substrate 2 which has Opening 2a in an approximately center, two or more probe needle 3 -- supported by this substrate 2, and the feed section 4 which supplies covering liquid 5 to the probe needle 3 so that the tip side surface of each probe needle 3 may always be covered, and is constituted.

[0013] The predetermined conductor pattern (illustration abbreviation) by which a substrate 2 is connected to the inspecting circuit of the main part of probe equipment (illustration abbreviation) is formed. Moreover, each probe needle 3 is fixed and supported by the opening 2a periphery of the substrate 2 by the insulating fixed material 6, such as resin, where the end side is connected to the conductor pattern of a substrate 2. With this, it extends aslant towards the lower part of the approximately center of Opening 2a from the periphery of Opening 2a, and the tip side which is an other end side is prepared in the state where it gathered down the approximately center of Opening 2a. Furthermore, the probe needle 3 is formed in the state where the nearly tip bent downward to the abbreviation perpendicular further.

[0014] A feed section 4 is equipped with the sponge part 4a which contains covering liquid in the state where covering liquid 5 sank in in this embodiment, and is constituted. The sponge part 4a is continued and attached to the whole periphery of the opening 2a of a substrate 2 in this embodiment. And each probe needle 3 is supported by the substrate 2 in the state where it was inserted in the sponge part 4a. That is, the tip side which is the portion which projected from the sponge part 4a has exposed the probe needle 3 outside, and since this tip side is extended and prepared in the slanting lower part, the whole surface by the side of a tip is in the state where it was covered with the covering liquid 5 included in the sponge part 4a.

[0015] If \*\*\*\*\* covering liquid 5 is a liquid which is nonvolatile and does not corrode an inspected object in inspection atmosphere while being non-conducting, it can adopt various liquids as such a sponge part 4a. As such a liquid, the material of the 3rd oil used as \*\*\*\*\* , a contact revival agent, etc. is mentioned, for example. Although the 3rd oil is a liquefied thing besides heavy oil and creosote oil at 20 degrees C and the flash point is 70-degree-C or more the thing below 200 degrees C here, a removable thing is easily suitable from an inspected wafer.

[0016] Supply of the covering liquid 5 to the sponge part 4a is manually performed using a syringe etc. Or a tube is connected to the container with which covering liquid was filled

through a supply pump etc., and supply of covering liquid 5 may be made to be made by the control means which controls the drive of a supply pump by the sponge part 4a automatically from the tip of a tube. It is important to supply covering liquid 5 to the sponge part 4a so that it may be in the state where the tip side of the probe needle 3 was always covered with covering liquid 5, by any supply means.

[0017] Next, based on the electrical characteristics inspection of each chip of the wafer by probe equipment equipped with such a probe card 1, one embodiment of the electrical-characteristics-inspection method of the inspected object concerning this invention is explained. Drawing 4 (a) - (c) is an important section sectional view for explaining the electrical-characteristics-inspection method of each chip of the wafer concerning an embodiment in order of a process.

[0018] [ in conducting electrical characteristics inspection of each chip of a wafer 7 ] the tip of the probe needle 3 of each chip prepared in the wafer 7 as a wafer 7 is laid on the installation stand which was first installed under the probe card 1 with probe equipment, and which is not illustrated and it is shown in drawing 4 (a) which corresponds the electrode pad 7a which consists of aluminum -- you make it located mostly just under In the state before this inspection, the whole surface by the side of the tip of the probe needle 3 is in the state where it is covered with the feed section 4 with covering liquid 5. Therefore, since it is in the state which is not exposed to the atmosphere, oxidization does not occur in the tip side of the probe needle 3.

[0019] Next, by turning an installation stand to a probe card 1, raising it, and contacting the tip of the probe needle 3 to the electrode pad 7a of a wafer 7, as shown in drawing 4 (b) The inspecting circuit established in the main part of probe equipment through the probe card 1 and the electrode pad 7a of each chip are connected, predetermined current is sent through each chip from this inspecting circuit, and an electrical property is inspected.

[0020] Just before the tip of the probe needle 3 contacts the electrode pad 7a of a wafer 7, the tip side of the probe needle 3 is also covered [ \*\*\*\*\* ] with covering liquid 5, but since covering liquid 5 is a liquid, when it contacts the tip of the probe needle 3 to the electrode pad 7a, it will be in the state of getting off around. Therefore, it can be made to flow through the electrode pad 7a and the probe needle 3 certainly. Moreover, at the time of inspection, the whole surface by the side of the tip of the probe needle 3 is covered with a feed section 4 with covering liquid 5, and is in the state where it is not exposed to the atmosphere. Therefore, an electrical property will be inspected, covering the surface of the probe needle 3 with covering liquid 5, and preventing oxidization.

[0021] Moreover, about the surface of the probe needle 3, wrap covering liquid 5 is transmitted from the tip of the probe needle 3 to the electrode pad 7a of a wafer 7, and, also in the circumference of the contact portion of the tip of the probe needle 3, and the electrode pad 7a,

covering liquid 5 will be in a wrap state by this. Therefore, it can prevent that material, such as aluminum, adheres [ which oxidization does not occur in this contact portion and constitutes the electrode pad 7a ] at the tip of the probe needle 3, for example.

[0022] After termination of inspection drops an installation stand, and as shown in drawing 4 (c), it cancels contact with the tip of the probe needle 3, and the electrode pad 7a of a wafer 7. Since the tip of the probe needle 3 is immediately covered with covering liquid 5 and is not exposed to the atmosphere at this time, oxidization can be prevented. In addition, on the electrode pad 7a after termination of inspection, in order that the covering liquid 5 to which it was transmitted from the probe needle 3 may remain in a very small quantity, a wafer 7 is washed that this covering liquid 5 should be removed. The electrical characteristics inspection of each chip of a wafer 7 is completed according to the above process.

[0023] thus, [ the probe card 1 of this embodiment ] Since it has the feed section 4 which supplies the covering liquid 5 which is nonvolatile and does not corrode an inspected object in inspection atmosphere to the probe needle 3, and covers the whole surface by the side of the tip of the probe needle 3 with covering liquid 5 while being non-conducting, the oxidization by the side of the tip of the probe needle 3 can be prevented the time of inspection, and before and behind that. Moreover, the method of the above-mentioned embodiment which conducts electrical characteristics inspection of each chip of a wafer 7 can be enforced, covering the circumference of the contact portion of the tip of the probe needle 3, and the electrode pad 7a of a wafer 7 with covering liquid 5, and preventing oxidization etc.

[0024] Therefore, since the oxidization by the side of the tip of the probe needle 3 and the thing which constitute the electrode pad 7a and which material, such as aluminum, adheres at the tip of the probe needle 3, for example can be prevented according to the probe card 1 and the electrical-characteristics-inspection method of this embodiment It originates in these, contact resistance goes up, and it can prevent that loose connection occurs. Therefore, generating of various abnormalities in electrical characteristics inspection can be prevented, and the accuracy of electrical property inspection can be improved.

[0025] Moreover, since the number of times of cleaning of grinding the tip of the probe needle 3 is sharply reducible, a maintenance can be simplified and the life of the probe needle 3 also becomes long. Therefore, reduction of the cost which an inspection process takes can also be aimed at.

[0026] In addition, at this embodiment, although the 3rd oil was used as covering liquid, as mentioned above, while being non-conducting, it is nonvolatile in inspection atmosphere, and it cannot be overemphasized that what is necessary is to just be constituted by the liquid which does not corrode an inspected object that it is not limited to the 3rd oil.

[0027] Moreover, although this embodiment described the example which applied this invention to the probe card of the horizontal needle type, it has a natural probe needle to be

able to apply this invention also to the probe card of the perpendicular needle type prepared perpendicularly.

[0028]

[Effect of the Invention] Since it has composition equipped with the feed section which supplies covering liquid to a probe needle according to the probe card concerning this invention so that the tip side surface of a probe needle may always be covered as explained above, the oxidization by the side of the tip of a probe needle can be prevented the time of inspection, and before and behind that. Moreover, since the circumference of the contact portion of the tip of a probe needle and the electrode pad of an inspected object can also be covered with covering liquid in the time of inspection, adhesion with the tip of the probe needle of the material which constitutes the oxidization and the electrode pad in this contact portion can be prevented. Therefore, generating of various abnormalities in electrical characteristics inspection can be prevented, and the accuracy of electrical property inspection can be improved. Moreover, since the number of times of cleaning by the side of the tip of a probe needle is sharply reducible, a maintenance can be simplified, and since it becomes long [ the life of a probe needle ], shortening of time and the reduction of cost which an inspection process takes can also be aimed at.

[0029] moreover, [ the electrical-characteristics-inspection method of the inspected object of this invention ] Covering the tip side surface of a probe needle with covering liquid, contact the tip to the electrode pad of an inspected object, and electrical characteristics inspection of an inspected object is conducted. Since it was made to inspect where the circumference of the contact portion of the tip of a probe needle and the electrode pad of an inspected object is also covered with covering liquid Electrical characteristics inspection can be conducted stopping that the component of an electrode pad adheres at the tip of a probe needle without oxidizing the contact portion of the tip of a probe needle, and an electrode pad with the tip side of a probe needle. Therefore, like the above-mentioned invention, while being able to improve the accuracy of electrical property inspection, a maintenance can be simplified and the effect whose reinforcement a probe needle can also carry out is acquired.

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#### [Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing one embodiment of the probe card concerning this invention.

[Drawing 2] It is an A-A arrowed cross-section in drawing 1 .

[Drawing 3] It is the enlarged drawing of B portion in drawing 2 .

[Drawing 4] (a) - (c) is an important section sectional view for explaining one embodiment of

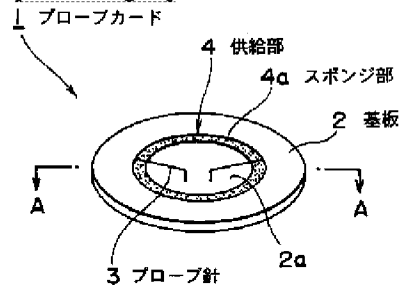


the electrical-characteristics-inspection method of the inspected object concerning this invention in order of a process.

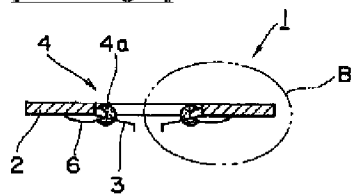
[Explanations of letters or numerals]

1 [ -- A feed section, 4a / -- A sponge part, 5 / -- Covering liquid, 7 / -- A wafer, 7a / -- Electrode pad ] -- A probe card, 2 -- A substrate, 3 -- A probe needle, 4

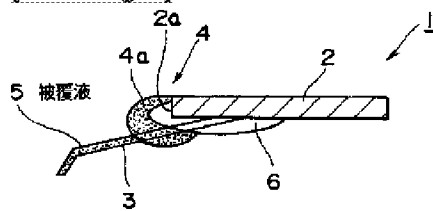
[Drawing 1]



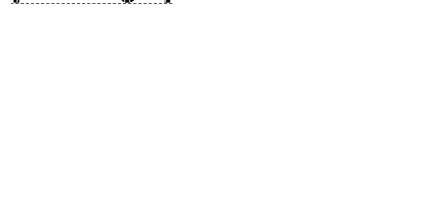
[Drawing 2]

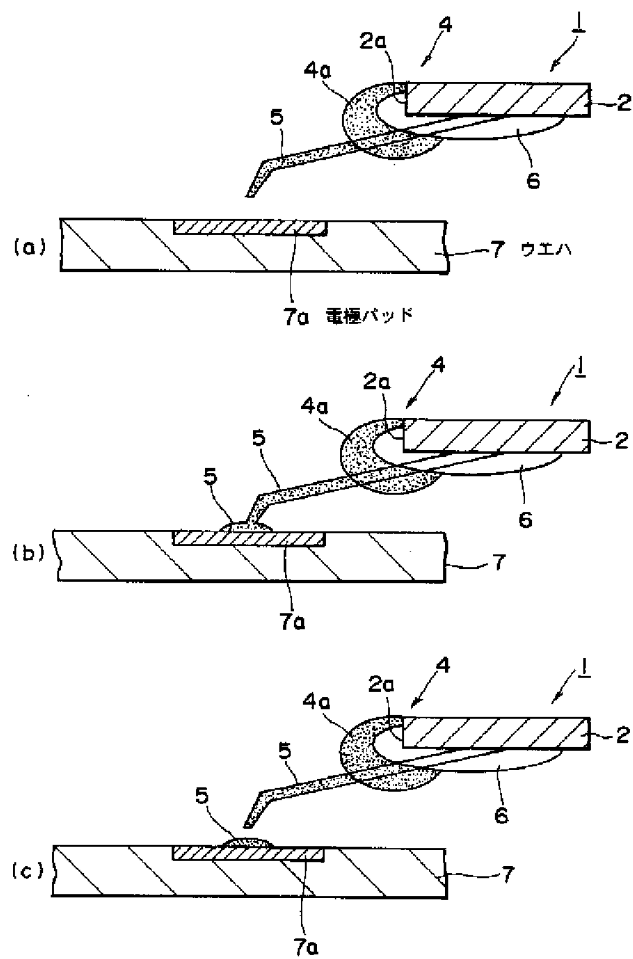


[Drawing 3]



[Drawing 4]





[Translation done.]